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## A POWER SPRAYER FOR APPLYING CONCENTRATED INSECTICIDES

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In connection with the development of a concentrated pyrethrum-oil spray for use in tobacco-storage warehouses, it was found necessary to design a new type of spray machinery, since no commercial spray equipment was found which could do the work desired. The machine herein described was developed in 1942 from the original ideas of the author.

Domestic cigarette types of tobacco are customarily stored in wooden hogsheads of approximately 1000 pounds net weight, and having a length of 48 or 54 inches and diameter of 48 inches. These hogsheads are stored lying on their sides with their ends very close together (fig. 1), and they are usually racked three tiers high. Tobacco warehouses vary considerably in size, but always have one feature in common: the floor space is almost completely covered with hogsheads except for an aisle about 10 feet wide. This aisle is generally across the middle of the warehouse, but is sometimes at one end or side of the building. Since the tobacco hogsheads extend to a height of 10 to 12 feet above the floor, it is impracticable to climb about over them with spray equipment. Consequently the most feasible method of applying spray is from the aisle. This means that the spray must be driven a distance of 30 to 100 feet, depending upon the size of the building. In most warehouses the distance does not exceed 75 feet.

Spray applied in a tobacco warehouse must be finely atomized to avoid wetting the hogsheads. Any appreciable wetting or deposit of spray material is considered objectionable. Spray guns such as are employed on large trees could not be used because they deliver a solid stream of liquid. No orchard spraying equipment could be found that would drive an atomized spray more than 35 feet.

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Another problem was the time-volume factor. Orchard sprayers are designed to deliver a large volume of liquid rapidly. In spraying tobacco warehouses it was desired to deliver a small amount of liquid (about 6 gallons in a large warehouse) slowly enough to obtain adequate coverage. This time proved to be 20 to 30 minutes for most warehouses.

The machine designed to meet the foregoing specifications is believed to embody a new application of well-known principles, and the results obtained with it under commercial conditions have been highly satisfactory. Although developed primarily for use in tobacco warehouses, there seems to be no reason why this machine should not prove satisfactory for use in other storage warehouses and in ship holds. Perhaps under certain conditions it may also be found to have a use in outdoor applications of insecticides.

The machine consists of a small orchard-type spray tank and compressor, a blower, an atomizing unit comprising a group of oil-burner type nozzles, and two electric motors (fig. 2). The compressor, A, and the motor, B, which operates it, are mounted on top of the tank, C. The compressor, although capable of delivering 400 pounds of pressure, was usually operated at 300 pounds. It was found necessary to enlarge the buffer air chamber, D. A gage mounted on the rear of the tank shows the liquid contents at a glance. The blower, E, is mounted in front of the tank on an extension of the chassis, as is the motor, F, that operates it. From the blower an air stack, G, extends upward to a height of 7 feet. The top of this stack is bent over slightly, and the spray nozzles, H, are placed in the mouth. The machine is so designed that the spray is delivered upward at an angle of approximately 15° to 20° from the horizontal, and as it leaves the nozzles it is caught and driven by the blast of air from the blower (fig. 3). The machine is similar to a power duster, except for the adaptations necessary to the use of a liquid spray.

#### Specifications:

Tank--Capacity not more than 50 gallons, equipped with strainers and a gage. Construction should be in accordance with standards of the National Board of Fire Insurance Underwriters.

Compressor--Reciprocal type, 2-cylinder, capable of delivering 400-pounds of pressure.

Air (or buffer) chamber--3 inches in diameter and 24 inches in length or 4 inches in diameter and 15 inches in length; the latter is preferable.

Blower--Air-pump type, capable of delivering 1250 cubic feet of air per minute at 1725 r. p. m., with fan of nonferrous metal.

Air stack--A pipe 8 inches in diameter and 7 feet high, and bent over at an angle of approximately  $75^{\circ}$  -  $80^{\circ}$  from the perpendicular.

Nozzles--10 of the oil-burner type, mounted in the mouth of the air stack, each nozzle capable of delivering 1.5 gallons of No. 2 oil per hour, at 100 pounds of pressure.

Motors--2 electric, 1 hp., 220-440 volts, 1.48-2.96 amperes, 1725 r. p. m., 60 cycles, 3-phase spark proof.

Switches--Spark proof.

Wheels--Rubber-tired.

This machine will blow a finely atomized fog of spray 75 to 80 feet over the hogsheads of tobacco, as customarily racked, three tiers high, in an open-type warehouse. Where there are no obstacles in the path of the spray, and in a closed building, it will readily drive the spray 100 feet or more. Even with a light breeze blowing through the warehouse at right angles to the path of the spray, this machine will drive the spray from 50 to 75 feet. Under such conditions fairly satisfactory coverage is obtained by operating the machine longer on the windward side of the building and allowing the breeze to drift the spray across the warehouse.

For use in very large warehouses, where it is necessary to drive the spray 100 feet or more, or where the hogsheads are racked with dunnage between the tiers. the machine was modified by using a taller air stack with a fishtail outlet. With the taller air stack the spray can be delivered horizontally across the tops of tiered hogsheads. In many warehouses the rafters are

at right angles to the path of the spray, and when the spray is delivered upward at an angle the rafters tend to act as baffles and reduce the distance the spray can be driven. By delivering the spray in a horizontal plane, the difficulty is overcome. This machine is a little more awkward to handle, and a 12-foot air stack will not pass through ordinary doorways. Therefore, it is necessary to hinge the stack so that it can be lowered for moving from one warehouse to another. Such a sprayer, with the air stack lowered, is shown in figure 4.



Figure 1.--Interior of tobacco-storage warehouse showing  
arrangement of hogsheads.

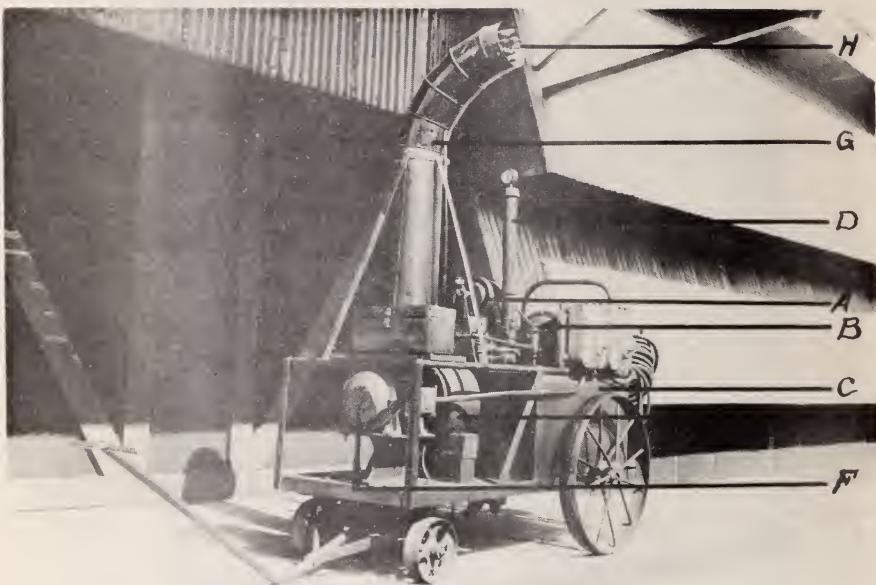


Figure 2.--Power sprayer developed for use in tobacco  
storage warehouses.



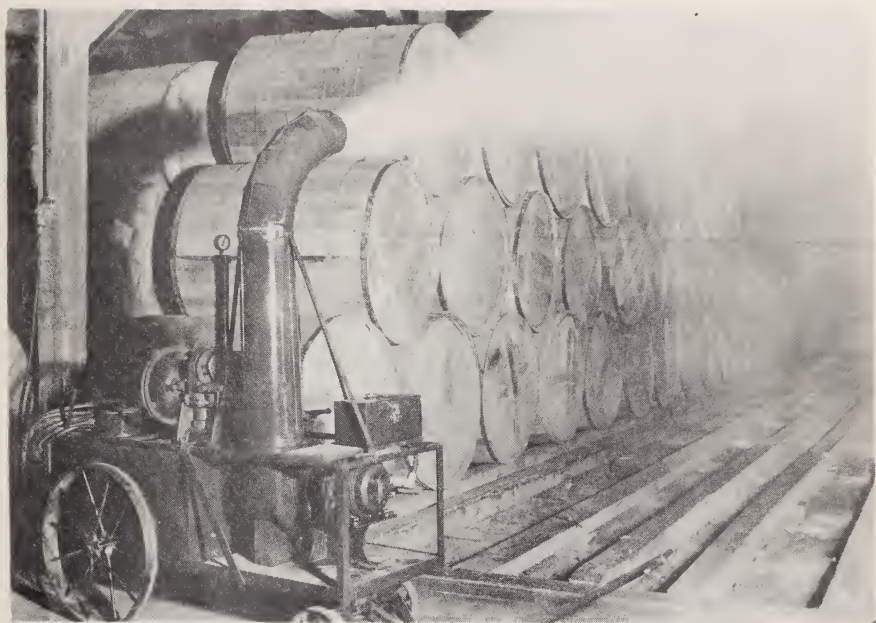


Figure 3.--Power sprayer in use in tobacco storage  
warehouse.

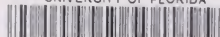


Figure 4.--Power sprayer developed for use in very large tobacco storage warehouses, showing the tall air stack lowered.